Geometry 7.4 Notes: Translations and Vectors (pp 421-424)

Large airports have many different ways of transporting people and their baggage. In the story below, Abigail is transported by three different mechanical devices. Each time, Abigail is moved from one point to another in a straight line, which models a *translation*.

Abigail arrives at the airport, parks her car in the parking garage, and walks to an elevator. She gets in the elevator at the fourth floor and goes to the first floor to check in. After checking in, she takes an escalator to the second floor and walks to the gate area. Instead of walking from Gate 1 to Gate 17, she stands on the moving walkway.

Name the three mechanical devices in the story that transport Abigail. Match each device with a figure below that shows her movement. Point *A* represents Abigail, and the image point represents her new position after the translation.

Figure 1

Figure 2

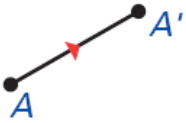

Figure 3

For each of the three mechanical devices, write a sentence that describes the change in position of Abigail. Your descriptions should include answers to some of the following questions. Was her movement *horizontal*, *vertical*, or *both*? What was the direction of her movement? How far did she move?

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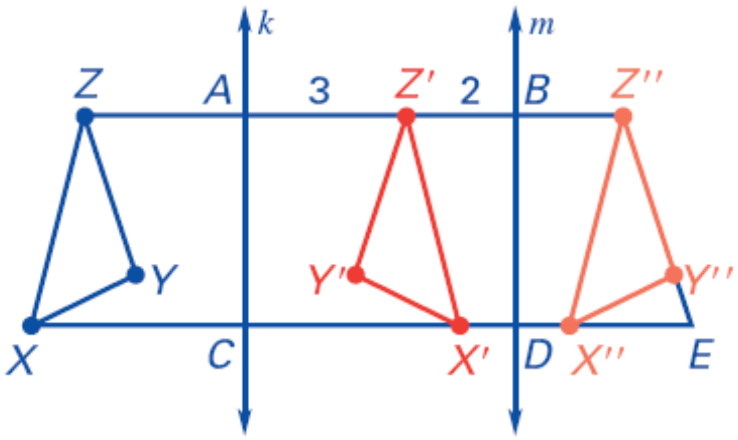
Examples.

In the diagram, a reflection in line *k* maps $\triangle XYZ$ to $\triangle X'Y'Z'$, a reflection in line *m* maps $\triangle X'Y'Z'$ to $\triangle X''Y''Z''$, k || m, AZ' = 3, & Z'B = 2.



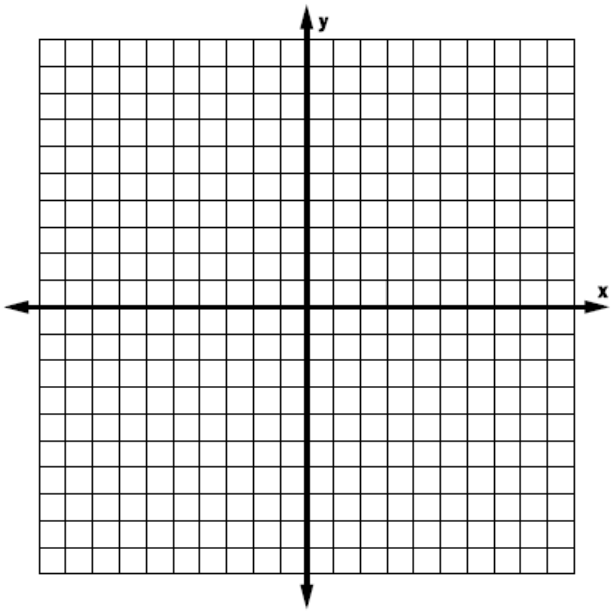
1. Name some congruent segments.

2. What kind of figure is ZZ"EX?

3. What is the length of ZZ"?

4. Name a pair of perpendicular segments.

5. Sketch a parallelogram with vertices R(-4, 1), S(-2, 0), T(-1, 3), U(-3, 2). Then sketch the image of the parallelogram after the translation $(x, y) \rightarrow (x+4, y-2)$.



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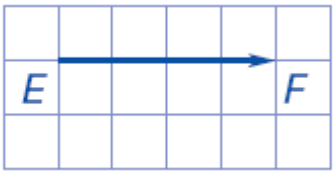
6. Guided Practice. $\triangle ABC \rightarrow \triangle A'B'C'$ by a translation defined by $(x, y) \rightarrow (x-5, y)$. The coordinates of the vertices of $\triangle ABC$ are A(7, 4), B(-1, 1), & C(-3, 5). What are coordinates of the vertices of $\triangle A'B'C'$?

Component form of a vector:

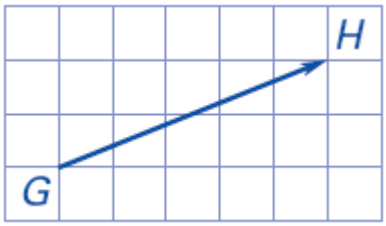
<u>Examples:</u> In the diagram, name each vector and write its component form.

7.

8.



9.



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Guided Practice.

10. The initial point of a vector is V(-2, 3) and the terminal point is W(-4,7). Name the vector and write its component parts.

11. The initial point of a vector is E(2, -6) and the terminal point is F(2, -9). Name the vector and write its component parts.

12. Example: The component form of $\overrightarrow{RS}$ is $\langle 2,-3 \rangle$. Use $\overrightarrow{RS}$ to translate the quadrilateral whose vertices are G(-3, 5), H(0, 3), J(1, 3) & D(3, -2).

13. Guided Practice: The component form of $\overrightarrow{MN}$ is $\langle 3,1 \rangle$. Use $\overrightarrow{MN}$ to translate the triangle whose vertices are R(0, 4), S(3, 1) & T(4, -2).

Examples.

14. $\triangle ABC \rightarrow \triangle A'B'C'$ using a translation. The vertices of $\triangle ABC$ are A(-4, 5), B(-1, 1) C(2, 3). The vertices of $\triangle A'B'C'$ are A'(-3, 2), B'(0, -4), & C'(3, 0). Write the component form of the vector that can be used to describe the translation.

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The coordinates of a logging site are S(5, 7). A logging truck traveling a straight line from the site to a mill at *M* encounters a road detour at *D* when it is 4 mi west and 2 mi south of the logging site. The truck must travel an alternate route to A(4, 3).

15. Write the component forms of the vectors from *S* to *D* and from *D* to *A*.

16. The mill is 6 mi west and 3 mi south of the logging site. Write the component form of the vector that describes the route the logging truck can follow to arrive at the mill.

Guided Practice.

17. $\overline{AB} \rightarrow \overline{A'B'}$ using a translation. The coordinates of the endpoints of $\overline{AB}$ are (-2, 1) & B(3, -1). The coordinates of $\overline{A'B'}$ are A'(1, -2) & B'(6, -4). Write the component form of the vector that can be used to describe the translation.

18. What is another name for a translation?

19. Vertex A(-3, 0) in $\triangle ABC \rightarrow A'(5,3)$. Describe the translation.

20. A _____ is a quantity that has both _____ and magnitude.

21. Describe the error.